CRANBERRIES

(1083)

# Science turns to sex hormone in bid to curb cranberry pest

## Male Sparganothis moths lured to bait nontoxic to bogs

By Jeff McLaughlin
GLOBE STAFF

EAST WAREHAM – UMass-Amherst scientists based at the Cranberry Experiment Station are helping cranberry growers reduce their use of pesticides to combat the growing threat posed by the destructive Sparganothis fruitworm.

The new technique uses a synthetic pheromone, or sex hormone, as bait in traps placed in cranberry bogs to capture male Sparganothis in their adult moth stage and thereby disrupt the normal mating pattern.

The pheromone is nontoxic, environmentally friendly, and species-specific – unlike the insecticides traditionally used to kill Sparganothis, which are strictly regulated by federal agriculture agencies under the Food Quality Protection Act of 1996.

In addition to their general threat to the environment, pesticides effective against Sparganothis have another major drawback: They also kill many of the parasitic flies and wasps which are natural enemies of the pest.

"This is really innovative and an important breakthrough for the industry and the environment," said Jeff LaFleur, executive director of the Cape Cod Cranberry Growers' Association.

"We've been working for years to reduce pesticide use, and we've been doing that with better controls and the integrated pest management methods," LaFleur said. "But this takes us one step beyond."

Integrated pest management, or IPM, is the generic term for environmentally friendly techniques used by farmers on a wide variety of commercial crops. Such methods supplement insecticides and hence allow application levels of toxic substances to be cut sharply. But pheromone traps are at the cutting edge of an emerging "biorational" or "bioin-

**A tiny Sparganothis pupa, in the palm of a hand. It is at the larvae and pupae stages that the species is most destructive.**

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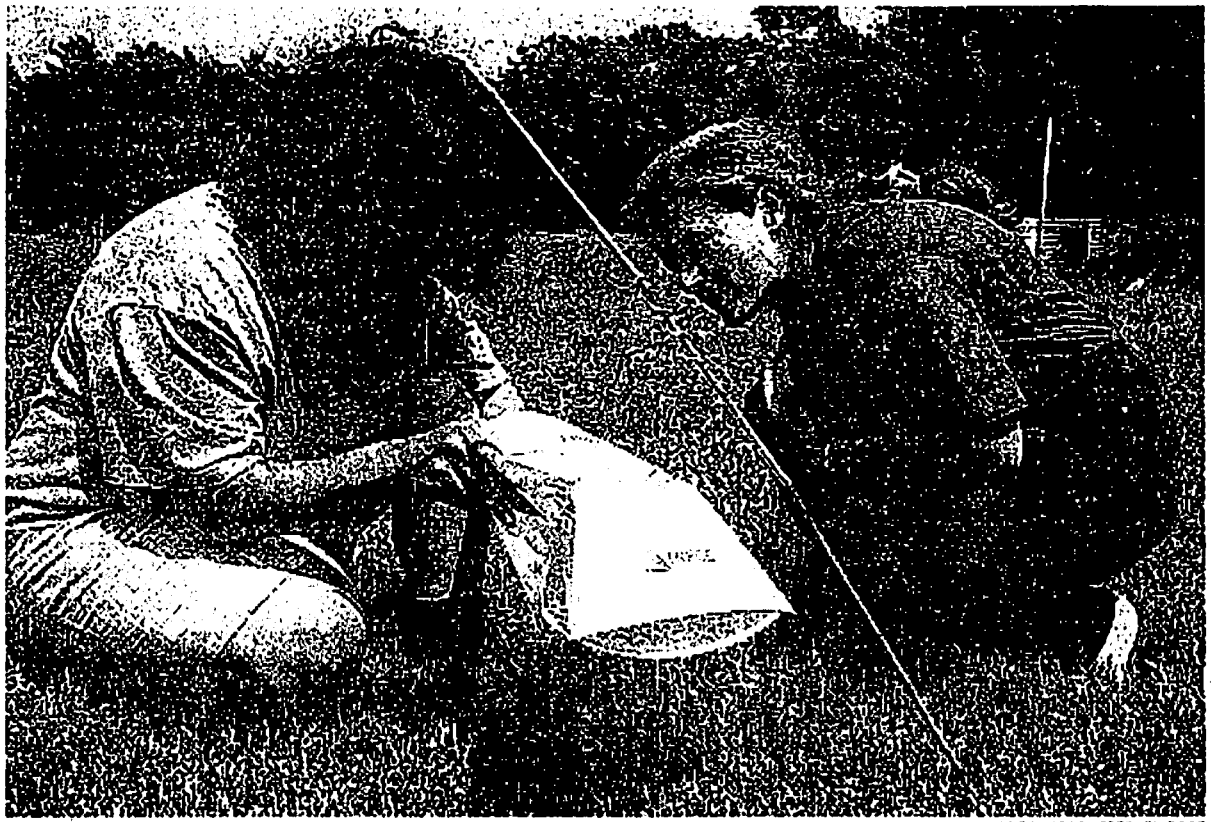

GLOBE PHOTOS / STEPHEN ROSE

**Entomologists Marty Sylvia (left) and Anne Averill of the Cranberry Experiment Station in Wareham check for signs of the Sparganothis fruitworm in a pheromone trap at a local cranberry bog.**

tensive" technology that someday might allow pesticides to be eliminated altogether in commercial fields, orchards, and bogs.

The cranberry, an ancient native North American fruit, has equally old and well-adapted pests associated with it, and without pesticides or other controls, 50 percent or more of the berries in any bog would be lost, so at present "organic" farming methods that use no chemicals are not commercially feasible.

"This is the next stage in pest management," said Anne Averill, a UMass-Amherst professor and the Cranberry Experiment Station's chief entomologist, as insect biologists are called. Averill said researchers hope that biointensive technology eventually eliminates pesticides.

Small amounts of the synthetic pheromone are placed in the simple paper traps. Although minute, the quantities are still far greater than the level released by a female Sparganothis to attract a male moth.

"So it's like a chemical searchlight, and the males are drawn to it in large numbers," said Averill. Once inside the trap, the male moths find themselves stuck in place by a sticky substance and escape is impossible. There are no environmental side effects, and Sparganothis populations can be sharply reduced. Insecticide use has not been eliminated in this, the first year of widespread use of the new technique, but pheromone traps plus the parasites may make that possible in another year or two.

A spur to such research and development is the adaptiveness of many insects: Sparganothis, for example, seems to have developed resistance to all but two government-approved insecticides, and evidence is accumulating that even those two are becoming less effective.

"The older chemicals are under severe scrutiny by federal and state environmental agencies anyway, and they are also losing effectiveness," said Gary R. Deziel, research and communication manager for the Cranberry Institute. The institute, also based in Wareham, is a nonprofit organization which helps fund scientific projects of importance to the industry. It is supported in turn by cranberry handlers and processors such as Ocean Spray Cranberries, Decas Cranberry Co., and Hiller Cranberry Sales, all based in Southeastern Massachusetts.

The infamous pesticide DDT, now banned nationwide because of its toxicity to wildlife, was used on cranberry bogs in the 1950s, and the first serious outbreaks of Sparganothis fruitworm were recorded soon thereafter. It had been observed in bogs since early in the 20th century, but only became a major damage-producer after DDT. Since Sparganothis was regarded as a minor pest at worst before DDT's introduction, Averill said, the clear implication is that DDT killed the parasites that had kept it in check.

It is the larvae and pupae of Sparganothis (its first two stages after leaving the egg) that are most

destructive to the cranberry crop. The species' life cycle works like this: The larvae feed on cranberry foliage in early spring, then use a silk-like secretion to web together new growth (called uprights on the cranberry plant to create a place for the pupae (the insects in their worm stage) to feed and grow.

The moths emerge from the pupa stage and mate in late June and early July. The females deposit egg masses on cranberry foliage and on developing fruit. Within two weeks, the tiny larvae of the second generation emerge and start feeding on foliage and fruit. The second-generation pupae become moths and fly during the early cranberry harvest days of September, and lay eggs, which hatch and spend the winter webbed into uprights. Then the cycle begins again.

Of the 14,000 acres of cranberry bogs in Southeastern Massachusetts, about 10 percent are affected by intense Sparganothis population levels. For reasons not yet well understood – though increased resistance to pesticides is believed to be a significant factor – the past four years have seen a sharp increase in the number of Sparganothis outbreaks in the state, according to Donald C. Weber, senior agricultural scientist for Ocean Spray Cranberries.

Averill, Weber, and an Indian entomologist now working at Rutgers University's Blueberry and Cranberry Research Center, Sridhar Polavarapu, collaborated last year on the initial field tests of the pheromone-trap mating disruption technique, which were conducted in Massachusetts. Results were promising, and the new approach is being used widely this year.

Analyzing and synthesizing pheromones is challenging, Averill said. The chemical composition is extremely complex, and if only one ingredient in a possible synthetic is "off" by a minute degree, the adult male moths will not enter a trap and be captured. Timing is also critical – the nontoxic alternatives to pesticides must be in place at the exact time that moths begin to fly if they are to be effective, she said.

The emerging Sparganothis success story is not the final chapter by any means, however.

"I've been working for 10 years on biointensive control techniques for another pest – the cranberry fruitworm, which is the number one problem for growers, the only one worse than Sparganothis," said Averill. "For a variety of reasons it is proving to be a hard nut to crack. But that's what we're here to do."

The Cranberry Experiment Station, which operates on an annual budget of about $770,000, was threatened by closure a few years ago when the state's higher education budget was being cut sharply. But an outcry from Southeastern Massachusetts caused UMass officials to rescind their order, and the station, founded in 1907, escaped the ax.